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Final Report Master Environmental Library, Task 1: Environmental Requirements

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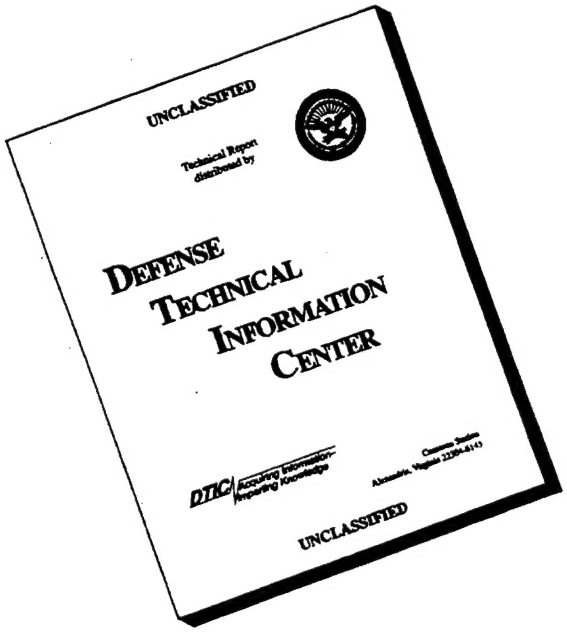

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13. ABSTRACT *(Maximum 200 words)*

Beginning in FY95, the Defense Modeling and Simulation Office (DMSO) provided funding to the multi-Service Master Environmental Library (MEL) Project for the purpose of developing and demonstrating a four-dimensional, digital, prototype DoD master environmental library for modeling and simulation (M&S) purposes. Task 1 of the MEL Project was Environmental Requirements, which was to identify environmental parameters and associated models and databases required by current modeling and simulation users, particularly in the oceanographic realm. Parameters, databases, and models were then to be recommended for prototype versions of the MEL as well as for a future, more complete MEL.

During FY95, the MEL Environmental Requirements Task created an environmental requirements and capabilities survey document and a database structure for assembling and reporting the results. The Task was not funded for FY96 because of the creation, under DMSO, of the Ocean Executive Agent which assumed, among other things, the responsibility for determining such ocean-related requirements and capabilities for the M&S community. This document is the Final Report for Task 1, presenting the survey document, explaining the rationale behind its structure, and summarizing the findings as of approximately 1 November 1995. Contributions from this effort include the survey document itself, a prototype oceanographic parameter taxonomy, and a compilation of some of the available authoritative oceanographic databases and data generating models.

The Master Environmental Library project was supported during FY95 by the Defense Modeling and Simulation Office under Program Element 0603832D. Dr. Ted Tsui of the Naval Research Laboratory, Code 7540, was the Project Manager during this time period.

This document is available in Word for Windows 6.0 on the MEL Homepage: http://wwwmel.nrlmry.navy.mil/homepage.html.

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environmental parameters, oceanography, model, simulation, databanks

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FINAL REPORT: MASTER ENVIRONMENTAL LIBRARY
TASK 1: ENVIRONMENTAL REQUIREMENTS

1.0 INTRODUCTION

The objective of the Environmental Requirements task (Task 1) of the Master Environmental Library (MEL) project was to identify environmental parameters and associated databases and models required by current modeling and simulation (M&S) users, particularly in the oceanographic realm. Parameters, databases and models were then to be recommended for prototype versions of MEL as well as for a future near-operational MEL. The approach of the task was influenced by the work being done by the Requirements Task of the Environmental Effects for Distributed Interactive Simulation (E2DIS) project, initiated approximately a year before the MEL project. One task in E2DIS was conducting and analyzing a survey to identify atmospheric and near space requirements and capabilities for the M&S community. The MEL Task 1 therefore decided to build upon E2DIS's work and conduct a survey on oceanographic requirements and capabilities, particularly in littoral regions. Because of funding limitations, the scope of the survey, particularly in capabilities, had to be somewhat restricted.

Work on the Task began with receipt of funding in February 1995. Several preliminary versions of a requirements and capabilities survey document were prepared and presented for comment at MEL Quarterly meetings. The final version was completed for the 6-7 September 1995 Quarterly Meeting in Monterey, CA. At that time, relevant persons at the Naval Post Graduate School and the Fleet Numerical Meteorology and Oceanography Center completed the survey with a MEL representative (DF) present. The MEL representative answered questions on interpretation of surevey questions and took notes for further refinement of the document. The answers were later entered into a database under Microsoft ACCESS. A large number of other contacts had been identified through email sent out via various modeling and simulation mailing lists, and we were in the process of contacting them when the decision was made by the Ocean Executive Agent not to fund Task 1 in FY96, starting 1 October 1995. The Ocean Executive Agent has as one of its functions the determination of oceanographic M&S requirements and capabilities, and the Office felt it more appropriate that it fund the survey directly rather than through the MEL project. This final report documents the MEL Task 1 accomplishments and results as of 1 November 1995.

2.0 THE M&S OCEANOGRAPHIC REQUIREMENTS AND CAPABILITIES SURVEY

The survey document was constructed in three parts, given in Appendices 1, 2 and 3. The first part, designed to be easily completed by a potential M&S participant without interaction with MEL personnel, was intended to elicit background information. Results from this part of the survey would allow us to determine if further contact was appropriate. Parts 2 and 3 were intended to be answered with the assistance of MEL personnel, although we attempted to make the survey questions clear enough that this should not strictly be necessary.

Part 2 was to be filled out for each model, database, or simulation. It identified:

Name of model, simulation, database
Description/purpose
Spatial extent
Geographic area
DMSO M&S functional area
M&S Application
Constructive, virtual, live?
Type of application

Part 3 identified, first, the environmental parameters used or generated by the model, simulation, or database and the corresponding horizontal, vertical, temporal and angular scales. Second, it asked what commonly available databases, databanks, and data generating models were used by the model or simulation. For more details on the survey document, refer to the appendices.

2.1 OCEANOGRAPHIC PARAMETER AND DATA SOURCE TAXONOMIES

As a result of the thought that went into constructing a survey that was as straightforward and easy to understand and complete as possible, taxonomies were constructed for oceanographic parameters and for oceanographic data sources (databases, databanks, and data generating models). The oceanographic parameter taxonomy has the following main categories:

A. Geophysics
   1. Geology
   2. Gravimetry
   3. Geomagnetism

B. Bathymetry

C. Physical Parameters
   1. Hydrodynamics
   2. Temperature
   3. Tides
   4. Waves
   5. Circulation / Currents
   6. Ice
   7. Features

D. Optics
   1. Visibility
   2. Refractive index

E. Biologics
   1. Bioluminescence
   2. Biofoulants
   3. Bacteria
   4. Plants
   5. Animals
   6. Depth of Euphotic Zone

F. Chemistry/Water Quality
   1. Density
   2. Salinity / Electrical Conductivity
   3. Nutrient Concentrations
   4. pH
   5. Dissolved Gases
   6. Trace Metals
   7. Radionuclides
   8. Pollutants

G. Acoustics
   1. Ambient Noise
   2. Sea State
   3. Absorption / Absorption Coefficient
   4. Volume Reverberation
   5. Sound Speed
   6. Bubble Density
   7. Transmission Loss
   8. Surface Reflection Loss / Loss per Bounce

H. Atmospheric Boundary Layer

1. Atmospheric Parameters
2. Oceanic Parameters
3. Albedo

I. Nearshore (Surf and Swash Zones)
1. Water Depth
2. Surf
3. Sediment Transport
4. Obstructions

J. Backshore ("Beach and Beyond")
1. Boundaries
2. Beach
3. Physiographic Features
4. Vegetation
5. Animal Life
6. Human Activities
7. Transportation
8. Utilities

Further category breakdown and the parameters themselves are given in Appendix 3. We feel this taxonomy probably would have changed little if we had had the opportunity to apply it to the completed survey results, and it would have allowed a good assessment of the most important parameters and scales for M&S applications. We suggest it be considered by the M&S community as a prototype oceanographic parameter taxonomy.

Databases and databanks were categorized into

1. Physical
2. Geophysical
3. Optical
4. Biological
5. Meteorological

(Databanks are continuously evolving archives of data, such as an expanding time series of satellite images from an area.) We are of the opinion that the categorization would have been expanded by a few categories after compilation of a full set of survey answers. The survey results for this section and for the data generating model section would have identified the vast majority of oceanographically-oriented databases/databanks and data generating models available to the M&S community and would have provided good guidance for what to include in the long term MEL. Hopefully this crucial information will later become available to the MEL project as a result of efforts funded by the Ocean Executive Agent.

Data generating models were categorized into only physical, oceanographic and meteorological, but if the survey had been completed and a larger body of models identified, the same breakdown as for databases and databanks would probably have become appropriate.

A summary of the databases and data generating models identified up to this point and which the MEL Project should consider for inclusion in both prototype and long-term MELs is given in Appendix 4.

3.0 RESULTS

The first year's effort on this Task (consisting of 7 months' work) primarily completed the development of the survey document and the construction of the database structure for compiling and reporting the results; only 20 surveys were actually completed before the Task was terminated. However, a summary of the results so far as extracted from the Microsoft ACCESS database are given in Appendix 5, along with a list of the participants. These limited results, of course, should not be considered necessarily representative of what would have been found if the full M&S community had been surveyed.

Contributions from this brief effort include the survey document itself, a prototype oceanographic parameter taxonomy, and a compilation of some of the available authoritative oceanographic databases and data generating models.

Acknowlegements

The Master Environmental Library project was supported during FY95 by the Defense Modeling and Simulation Office under Program Element 0603832D. Dr. Ted Tsui of the Naval Research Laboratory Code 7540 was the Project Manager during this time period. The MEL project owes its existence to the vision, energy and persistence of NRL Code 7320's Dr. John Harding.

APPENDIX 1

M&S ENVIRONMENTAL REQUIREMENTS SURVEY

PART 1: BACKGROUND INFORMATION

ID # _____
Date_____

Master Environmental Library (MEL)
Modeling & Simulation (M&S)
Environmental Requirements Survey

This is part 1 of a 3 part survey being conducted for the Defense Modeling and Simulation Office (DMSO) - sponsored Master Environmental Library (MEL) project. The objective of the survey is to identify:

- Potential users of MEL and their needs, and
- Potential suppliers of environmental information to be included in MEL

In case questions arise, we suggest this survey be filled out during telephone or in-person interviews with a MEL representative. However, independently completed surveys will be gratefully received. Please send to: Dr. Janice Boyd; NRL Code 7332; Stennis Space Center, MS 39529; fax 601-688-4843.

For more information, contact Dr. Janice Boyd (janice.boyd@nrlssc.navy.mil), 601-688-5251 or Ms. Daphne Frilot (frilot@neptunesci.com), 504-649-7252.

Part 1: Background Information

1. Technical Expert for Model, Simulation, Database, or Databank

a. Rank/Title, Name _____

b. Military Service/Organization _____

c. Mailing Address _____

_____

_____

d. Phone Numbers

Office: DSN _____ - _____

Commercial ( ) _____ - _____

Fax: DSN _____ - _____

Commercial ( ) _____ - _____

e. E-mail Address _____

2. Do you use/generate environmental data?
   a. Yes
   b. No

3. If yes, what type of environmental data do you use? *{Choose all that apply}*
   a. Deep Ocean
   b. Littoral
   c. Ocean Bottom
   d. Air-Sea Interaction
   e. Atmospheric
   f. Near Space
   g. Terrain

4. If answered yes to question 2, what type of environmental data do you generate? *{Choose all that apply}*
   a. Deep Ocean
   b. Littoral
   c. Ocean Bottom
   d. Air-Sea Interaction
   e. Atmospheric
   f. Near Space
   g. Terrain

5. If you use/generate environmental data, do you primarily *{Choose all that apply}*
   a. Use it as input to model or simulation?
   b. Create data via data generating model?
   c. Create database (time-invariant climatology of real data)?
   d. Create databank (time-evolving real data)?

APPENDIX 2

M&S ENVIRONMENTAL REQUIREMENTS SURVEY

PART 2: GENERAL INFORMATION AND APPLICATION

ID # _____
Date_____

Master Environmental Library (MEL)
Modeling & Simulation (M&S)
Environmental Requirements Survey

This is part 2 of a 3 part survey being conducted for the Defense Modeling and Simulation Office (DMSO) - sponsored Master Environmental Library (MEL) project. The objective of the survey is to identify:

- Potential users of MEL and their needs, and
- Potential suppliers of environmental information to be included in MEL

In case questions arise, we suggest this survey be filled out during telephone or in-person interviews with a MEL representative. However, independently completed surveys will be gratefully received. Please send to: Dr. Janice Boyd; NRL Code 7332; Stennis Space Center, MS 39529; fax 601-688-4843.

For more information, contact Dr. Janice Boyd (janice.boyd@nrlssc.navy.mil), 601-688-5251 or Ms. Daphne Frilot (frilot@neptunesci.com), 504-649-7252.

Part 2: General Information and Application

{Fill out the following sections for each model or simulation}

Contact person if survey clarification is needed (e.g., name, telephone, email)

_____

_____

I. General Information

1. Model or Simulation Name _____

_____

2. General description of the model or simulation's purpose *{One or two sentences are sufficient or attach published description; Include model output resolution if <u>not</u> a data generating model}*

_____

_____

_____

_____

3. What is the spatial coverage of the model or simulation?

a. Global	(All Ocean/Sea Areas, including adjacent coastlines)
b. Regional	(Specific Ocean Regions, including adjacent coastlines; e.g., western North Atlantic, eastern Mediterranean Sea)
c. Local	(Very Specific Ocean Areas, including adjacent coastlines; e.g., southern California)
d. Coastal/Littoral	(Area from 60 nmi offshore to the high water mark on shore)
e. Not applicable for this model or simulation	

4. What specific geographic area(s) does your model or simulation cover (e.g., North Atlantic Ocean, Mediterranean Sea)? *{Enter N/A if not applicable for this model or simulation}*

_____

5. Under which DMSO M & S functional area does the model or simulation best fit?
   a. Research and Development (R & D)
   b. Testing and Evaluation (T & E)
   c. Production and Logistics (P & L)
   d. Analysis
   e. Education, Training and Military Operations (ETMO)

6. Would MEL be useful for your applications?
   a. Yes
   b. No
   c. Need More Information on MEL

II. Modeling & Simulation Application

1. The model or simulation is used for what type of simulation?
   a. Constructive *(Typically classroom-setting simulations of large scale (e.g. theater-wide) military activities; automated wargames)*
   b. Virtual *(Forces, platforms, weapon systems, and sensors modeled in simulators and fighting on synthetic battlefields depicted by these simulators; human-in-the-loop simulators)*
   c. Live Play *(Simulations using real-world forces and equipment in the field)*

2. Application(s) of Model or Simulation *{Indicate all items that apply}*

EQUIPMENT

Equipment Characteristics *(Physical description)*

a. Air
b. Land
c. Sea
d. Missiles
e. Electronics
f. Sensors
g. Other _____

Equipment Performance *(How well equipment performs its function)*

h. Air
i. Land
j. Sea
k. Missiles
l. Electronics
m. Sensors
n. Other _____

TACTICS, TECHNIQUES & PROCEDURES (TTP) COGNITIVE

o. Tactics *(Employment of units in combat)*
p. Operational *(Processes for carrying out mission functions)*
q. Doctrine *(Principles by which operations are conducted)*
r. Other _____

PREDICTIVE MODELS *(Forecast or nowcast of environmental parameters)*

s. Oceanographic Environment
t. Shore Environment
u. Atmospheric Environment
v. Near-Space Environment
w. Other _____

FORCE DESCRIPTION *(Organization of personnel and equipment)*

x. Human Intelligence (HUMINT)
y. Measured & Signature Intelligence (MASINT)
z. Signals Intelligence (SIGINT)
a2. Imagery Intelligence (IMINT)
b2. Other _____

HUMAN FACTORS *(Interaction of people with equipment, environment, other conditions)*

c2. Sensory *(Internal or external description of event)*
d2. Perceptual *(Level of information required to determine course of action)*
e2. Physical *(Characteristics of human body)*
f2. Cognitive *(Decision making)*
g2. Social *(Common characteristics of society members)*
h2. Other _____

SERVICE SUPPORT *(Assistance furnished to operating forces)*
I2. Transportation
j2. Medical
k2. Maintenance
l2. Supply
m2. Other _____

SCENARIO

Army

n2. Strike Warfare (STW)
o2. Space and Electronic Warfare (SEW)
p2. Logistics (LOG)
q2. Command, Control, Communications, Intelligence (C^3I)
r2. Other _____

Navy

s2. Antisubmarine Warfare (ASW)
t2. Amphibious Warfare (AMW)
u2. Naval Special Warfare (NSW)
v2. Strike Warfare (STW)
w2. Mine Warfare/Mine Countermeasures (MIW/MCM)
x2. Antiair Warfare (AAW)
y2. Antisurface Warfare (ASUW)
z2. Ocean Surveillance (OS)
a3. Logistics (LOG)
b3. Command, Control, Communications, Intelligence (C^3I)
c3. Other _____

Air Force

d3. Strike Warfare (STW)
e3. Antiair Warfare (AAW)
f3. Space and Electronic Warfare (SEW)
g3. Ocean Surveillance (OS)
h3. Logistics (LOG)
I3. Command, Control, Communications, Intelligence (C^3I)
j3. Other _____

Marine Corps

k3. Amphibious Warfare (AMW)
l3. Naval Special Warfare (NSW)
m3. Mine Warfare/Mine Countermeasures (MIW/MCM)
n3. Ocean Surveillance (OS)
o3. Logistics (LOG)
p3. Command, Control, Communications, Intelligence (C^3I)
q3. Other _____
r3. Joint *(Two or more services)*
s3. Combined *(Two or more allied participants)*

Operations Other Than War

t3. Wargames
u3. Other _____
v3. Guidance *(Goals, priorities, doctrine)*
w3. Peace *(Planning guidance)*

TEST RESULTS *(Ability of system to meet requirements)*

x3. Operational *(Performance, sustainability)*

y3. Developmental *(Value of design or technology)*

z3. Exercise

a4. Other _____

MISCELLANEOUS

b4. Training (Simulation)

c4. Policy and Management

d4. Acquisition

e4. Other _____

3. Comments?

_____

_____

_____

APPENDIX 3

M&S ENVIRONMENTAL REQUIREMENTS SURVEY

PART 3: ENVIRONMENTAL PARAMETERS AND DATABASES

ID # _____
Date_____

Master Environmental Library (MEL)
Modeling & Simulation (M&S)
Environmental Requirements Survey

This is part 3 of a 3 part survey being conducted for the Defense Modeling and Simulation Office (DMSO) - sponsored Master Environmental Library (MEL) project. The objective of the survey is to identify:

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For more information, contact Dr. Janice Boyd (janice.boyd@nrlssc.navy.mil), 601-688-5251 or Ms. Daphne Frilot (frilot@neptunesci.com), 504-649-7252.

Part 3: Environmental Parameters and Databases

Contact person if survey clarification is needed (e.g., name, telephone, email)

_____

_____

Model, Database, or Simulation Title _____

I. Environmental Parameters

This section will determine which environmental parameters are used as input or (if applicable) generated as output by the model or simulation and identify their needed resolutions.

1. In the parameter list that follows, please indicate which parameters are:{Indicate all that apply}
   - Supplied by a database/databank (enter check in "In?" column);
   - Needed as input for a simulation or data generating model (enter check in "In?" column);

or

   - Computed as output by a data generating model (enter check in "Out?" column)

2. For each checked parameter in the list, use the supplied codes to indicate needed resolutions. Ignore groups that do not apply (e.g., angular). {Resolution refers to the largest unit of input measurement necessary to obtain acceptable output from the model or simulation (i.e., any smaller unit, though perhaps desired, would not significantly improve output accuracy; Specific output resolutions should be included for data generating model output}

Spatial Resolution Codes:

Horizontal Scales: ("SScale - H")

Code	Resolution
Hd.	100 meters
He.	1 kilometer
Hf.	10 kilometers
Hg.	100 kilometers
Hh.	1,000 kilometers
Hi.	10,000 kilometers
Hj.	greater than 10,000 kilometers

Vertical Scales: ("SScale - V")

Code	Resolution
Va.	1 millimeter or less
Vb.	1 centimeter
Vc.	1 meter
Vd.	100 meters
Ve.	1 kilometer
Vf.	10 kilometers
Vg.	100 kilometers
Vh.	1,000 kilometers
Vi.	10,000 kilometers
Vj.	greater than 10,000 kilometers

Temporal Scales: ("TScale")

Code	Resolution
Ta.	0.1 seconds and less
Tb.	1 second
Tc.	10 seconds
Td.	1 minute
Te.	1 hour
Tf.	several hours
Tg.	1 day
Th.	1 week
Ti.	1 month
Tj.	1 year
Tk.	1 decade
Tl.	greater than decade (used for climatological)

Angular Scales: ("AScale")

Code	Resolution
Aa.	1 degree
Ab.	10 degrees
Ac.	45 degrees
Ad.	90 degrees
Ae.	180 degrees
Af.	greater than 180 degrees

3. Oceanographic parameter taxonomy

Please go through the following list, checking which parameters are used as input or generated as output and using the above codes to indicate needed resolutions. Note: the parameters are grouped into the following oceanographically-oriented categories. Only the last category is not ocean water covered at least part of the time:

A. Geophysics
B. Bathymetry
C. Physical Parameters
D. Optics
E. Biologics
F. Chemistry/Water Quality
G. Acoustics
H. Atmospheric Boundary Layer
I. Nearshore (Surf and Swash Zone)
J. Backshore ("Beach and Beyond")

	In?	Out?	SScale H,V	TScale/ AScale
A. GEOPHYSICS				
1. Geology				
Physical Bottom Characteristics				
Sediment Classification				
Sediment Type (material) (by layer, if appropriate)				
Sediment Thickness/Layer Thickness				
Grain Size/Grain Size Distribution				
Compressibility				
Bulk Density				
Sediment Concentration				
Roughness				
Shear Strength				
Other				
Acoustical Bottom Characteristics				
Bottom Loss/Bottom Loss Per Bounce				
Attenuation Coefficient(s)/Attenuation Gradients				
Bottom Scattering				
Sediment Sound Speed (SS)/Sediment Layer SS/Gradients				
Porosity				
Other				
Seismic Activity				
Location				
Type (source mechanism)				
Strength				
Other				
Underwater Obstacles/Obstructions				
Other				
2. Gravimetry				
Geoid Height				
Gravity				
Free Air Anomaly				
Other				
3. Geomagnetism				

	In?	Out?	SScale H,V	TScale/ AScale
Magnetic Field Intensity				
Horizontal				
Vertical				
Magnetic Variation				
Magnetic Inclination				
Magnetic Anomaly				
Other				
B. BATHYMETRY				
Water Depth				
Bottom Slope/Gradient				
C. PHYSICAL PARAMETERS				
1. Hydrodynamics				
Wakes				
Turbulence				
Mixed Layer Depth				
Horizontal Diffusivity				
Vertical Diffusivity				
Mixing Length Coefficient				
Other				
2. Temperature				
Depth Profile				
Other				
3. Tides				
Elevation				
Elevation Constituents (amplitude & phase)				
Tide Ranges (Mean, Spring, Neap)				
Currents				
Current Constituents (amplitude & phase)				
Datums (MTL, MLW, MLLW, MHW, MHHW)				
Other				
4. Waves				
Internal Waves				
Amplitude				
Direction/Angle				
Frequency				
Wavenumber/Wave Length				
Frequency Spectrum				
Wavenumber Spectrum				
Frequency-Wavenumber Spectrum				
Currents				
Wind Waves ("Sea")				
Type (deep, intermediate, shallow)				
Sea State				
Wave Direction/Angle				
Wave Height/Significant Wave Height				
Wave Period/Frequency				
Wavenumber/Wave Length				
Refraction				
Angle				

	In?	Out?	SScale H,V	TScale/ AScale
Coefficient				
Frequency (nondirectional) Spectrum				
Wavenumber (directional) Spectrum				
Spectral Frequency/Period				
Mean				
Peak				
Peak Spectral Height				
Spectral Propagation Direction				
Mean				
Peak				
Swell				
Swell Direction/Angle				
Swell Height				
Swell Period/Frequency				
Frequency (nondirectional) Spectrum				
Wavenumber (directional) Spectrum				
Storm Surge				
Elevation				
Water Velocity				
Hurricane Parameters				
Radius to Maximum Winds				
Air Pressure Difference (Central press./peripheral press.)				
Maximum Wind Speed				
Storm Track (speed, direction)				
Extratropical Storm Parameters				
Regional Winds				
Storm Track (speed, direction)				
Other				
Tsunamis				
Other				
5. Circulation / Currents				
Horizontal				
Depth-Averaged (speed, direction)				
Surface				
Subsurface				
Current Shear				
Vertical				
Depth-Averaged				
Profile (speed, direction)				
Current Shear				
Type				
"Mean"				
Wind-driven				
Geostrophic				
Inertial				
Ekman				
Shelf Wave				
Tidal				
Other				
6. Ice				
Sea Ice				

	In?	Out?	SScale H,V	TScale/ AScale
Type				
Concentration				
Extent				
Thickness				
Location				
Icebergs				
Location				
Other				
7. Features				
Fronts				
Location				
Temperature Gradient - Horizontal				
Temperature Gradient - Vertical				
Sound Speed Gradient - Horizontal				
Sound Speed Gradient - Vertical				
Mixed Layer/Sonic Layer Depth Change				
Sound Channel Axis Depth Change				
Eddies				
Location				
Radius				
Temperature Gradient - Horizontal				
Temperature Gradient - Vertical				
Sound Speed Gradient - Horizontal				
Sound Speed Gradient - Vertical				
Mixed Layer/Sonic Layer Depth Change				
Sound Channel Axis Depth Change				
Other				
D. OPTICS				
1. Visibility				
Diffuse Attenuation Coefficient				
Extinction Coefficient				
Secchi Depth				
Absorption Coefficient				
Scattering Coefficient				
Backscattering Coefficient				
Particle Density				
Gelbstoff				
Other				
2. Refractive index				
E. BIOLOGICS				
1. Bioluminescence				
Bioluminescent Intensity				
2. Biofoulants				
Biofoulant Accumulation/Accumulation Rate				
Mass				
Thickness				
Density				
3. Bacteria				
4. Plants				

	In?	Out?	SScale H,V	TScale/ AScale
Chlorophyll				
Phytoplankton				
Macrophytes (e.g., kelp)				
Percent Cover				
Location				
Type				
5. Animals				
Zooplankton				
Fish				
Dangerous Marine Animals				
Deep Scattering Layer				
6. Depth of Euphotic Zone				
F. CHEMISTRY/WATER QUALITY				
1. Density				
2. Salinity / Electrical Conductivity				
Depth Profile				
Other				
3. Nutrient Concentrations				
Particulate Organic Material				
Dissolved Organic Material				
Nitrate				
Nitrite				
Phosphate				
Sulfate				
Silicate				
Micronutrients				
Other				
4. pH				
5. Dissolved Gases				
Oxygen				
Other				
6. Trace Metals				
7. Radionuclides				
8. Pollutants				
9. Other				
G. ACOUSTICS				
1. Ambient Noise				
Anthropogenic (e.g., shipping, oil rig, etc.)				
Biological				
Wind/Wave				
Surf				
Rain/Precipitation				
Ice				
Thermal				
Seismic				
2. Sea State				
3. Absorption/Absorption Coefficient				
4. Volume Reverberation				
5. Sound Speed				

	In?	Out?	SScale H,V	TScale/ AScale
Profile/Gradient/etc				
Sonic Layer Depth				
Deep Sound Channel Axis				
Deep Sound Channel Thickness				
Shallow Sound Channel Axis				
Shallow Sound Channel Thickness				
Limiting Depth				
Depth Excess				
Sound Speed Excess				
Range to Convergence Zone				
Convergence Zone Width				
6. Bubble Density				
7. Transmission Loss				
8. Surface Reflection Loss/Loss Per Bounce				
9. Other				
H. ATMOSPHERIC BOUNDARY LAYER				
1. Atmospheric Parameters				
Wind				
Speed at 10 m (u)				
Friction Velocity (u)				
Roughness Length (z)				
Surface Wind				
Scalar				
Vector				
Wind Stress				
Scalar				
Vector				
Humidity				
Relative				
Specific				
Surface Air Pressure				
Air Temperature at 10 m				
Cloud Cover				
Precipitation				
Type				
Rate				
2. Oceanic parameters				
Mixed Layer Depth				
Sea Surface Temperature				
Surface Fluxes				
Solar Heat Flux				
Longwave (back) Heat Flux				
Latent Heat Flux				
Sensible Heat Flux				
Total Heat Flux				
3. Albedo				
I. NEARSHORE (SURF AND SWASH ZONES)				
1. Water Depth (note: may well be dynamic)				
2. Surf				

	In?	Out?	SScale H,V	TScale/ AScale
Direction/Angle				
Height				
Period				
Breaker Type				
Percent Breaking Waves				
Surf Zone Width				
Wave Setup/Setdown				
Nearshore Currents				
Longshore/Littoral				
Rip				
Wave-induced				
Other				
3. Sediment Transport				
Sediment Type/Type Distribution				
Sediment Density				
Volumetric Transport Rate				
Depth of Mobile Bed				
Bottom Stress				
Sediment Fall Rate				
Alongshore Wave Energy/Energy Flux				
Alongshore Water Velocity				
4. Obstructions (spits, bars, manmade, etc)				
J. BACKSHORE ("BEACH AND BEYOND")				
1. Boundaries				
Shoreline Position				
Other				
2. Beach				
Morphology				
Size (width, length)				
Slope/Gradient				
Composition				
Type (material)				
Grain size				
Effective Grain Size				
Median Grain Size				
Grain Size Distribution				
Density				
Packing Parameter				
Rated Cone Index				
Shear Strength				
Moisture				
Amount				
Ice Conditions				
Snow Cover				
Standing Water				
Obstacles/Obstructions				
Other				
3. Physiographic Features				
Rivers				
Morphology (width, length, depth)				

	In?	Out?	SScale H,V	TScale/ AScale
Discharge Rate				
Sediment Concentration				
Particle Density				
Nutrient Concentrations				
Pollutant Concentrations				
Radionuclide Concentrations				
Hills				
Mountains				
Lakes, Reservoirs, etc				
Marshes, Swamps, Wetlands				
Reference Points				
Seismic/Geologic Activity				
Other				
4. Vegetation				
Type				
Percent Cover				
Other				
5. Animal Life				
6. Human Activities				
Populated Areas				
Population Size				
Fishing				
Waterborne Traffic (commercial, recreational)				
Port Facilities				
Major Industries				
Police Facilities				
Military Facilities				
Governmental Facilities				
Hospitals				
Other				
7. Transportation				
Roads				
Railroads				
Waterways				
Other				
8. Utilities				
Communications Facilities				
Petroleum/Fuel Facilities				
Electrical Facilities				
Gas Facilities				
Other				

II. Databases/Databanks *{Indicate all items that apply}*

This section will determine what commonly available data sources are used by the model or simulation.

1. Indicate all PHYSICAL oceanographic/littoral databases/databanks that presently are used to supply input for your model or simulation

a. ATLAST
b. AVHRR (1) - Advanced Very High Resolution Radiometer (1)
c. AVHRR (2) - Advanced Very High Resolution Radiometer (2)
d. AVHRR (3) - Advanced Very High Resolution Radiometer (3)
e. BATHY - Bathythermograph Soundings
f. BERG - Antarctic Icebergs
g. BUOY - Oceanographic Drifting Buoy Data
h. CEDRIS - Coastal Engineering Data Retrieval System
i. COMPOSITE v1.0 - Front and Eddy Composite v1.0
j. DAILIES - Front and Eddy Analysis
k. DGDEM - Dynamic Generalized Digital Environmental Model
l. GDEM - Generalized Digital Environmental Model
m. ICECAP - Under Ice Roughness and Ridge Frequency
n. ICECLIMO - Sea Ice Climatology
o. Levitus
p. MCSST - Multi-Channel Sea Surface Temperature
q. MOODS - Master Oceanographic Observation Data Set
r. National Oceanographic Data Center (NODC) Historical Temperature & Salinity Profiles
s. ONRSWDB - Office of Naval Research Shallow Water Data Base
t. SAGEBATE - Salinity Geophysics Bathymetry Temperature
u. SATMSG - Enhanced Satellite Imagery
v. SCDB - Surface Currents Data Base
w. SHIP SYNOPTIC - Surface Ship Observations
x. SIGRID - Sea Ice Gridded Data
y. SNAR - Standard Navy Altimetry Record
z. SSCDB - Subsurface Currents Data Base
a2. STR SST - Shea-Trenbert Reynold Sea Surface Temperature
b2. SWAPS - Spectral Wave Prediction System
c2. Other _____

2. GEOPHYSICAL oceanographic/littoral databases/databanks that supply input for your model or simulation

a. BATHY - Bathythermograph Soundings
b. BBS - Bottom Backscatter
c. BUOY - Oceanographic Drifting Buoy Data
d. Coastal Shoreline
e. DBDB-1 - Digital Bathymetric Data Base - 1
f. DBDB-2 - Digital Bathymetric Data Base - 2
g. DBDB-5 - Digital Bathymetric Data Base - 5
h. DBDB-C - Digital Bathymetric Data Base - C
i. DCW - Digital Chart of the World
j. DFAD - Digital Feature Analysis Data
k. DNC - Digital Nautical Chart
l. DTED - Digital Terrain Elevation Data
m. ETOPO5
n. HFBL - High-Frequency Bottom Loss
o. HITS - Historical Temporal Shipping

p. ITD - Interim Terrain Data
q. LFBL - Low-Frequency Bottom Loss
r. MOODS - Master Oceanographic Observation Data Set
s. SAGEBATE - Salinity Geophysics Bathymetry Temperature
t. SN-DIAN - Shipping Noise-Directional Ambient Noise
u. SN-HIE - Shipping Noise-Historical Ice-Edge
v. SN-LRSN - Shipping Noise-Low Resolution Shipping Noise
w. SSMI - Special Sensor Microwave Imager
x. SYMBAPS - SYMBAPS Bathymetric
y. TerrainBase
z. VSS - Volume Scattering Strength
a2. WVS - World Vector Shoreline
b2. Other _____

3. OPTICAL oceanographic/littoral databases/databanks that supply input for your model or simulation

a. AVHRR (1) - Advanced Very High Resolution Radiometer (1)
b. AVHRR (2) - Advanced Very High Resolution Radiometer (2)
c. AVHRR (3) - Advanced Very High Resolution Radiometer (3)
d. CZCS (1) - Coastal Zone Color Scanner (1)
e. CZCS (2) - Coastal Zone Color Scanner (2)
f. Solar Irradiance
g. Other_____

4. BIOLOGICAL oceanographic/littoral databases/databanks that supply input for your model or simulation

a. CZCS (1) - Coastal Zone Color Scanner (1)
b. CZCS (2) - Coastal Zone Color Scanner (2)
c. ITD - Interim Terrain Data
d. Other_____

5. METEOROLOGICAL databases/databanks that supply input for your model or simulation

a. AIREPS - Aircraft Reports
b. AIRWAYS - Surface Aviation Observations
c. AMDAR - Aircraft Meteorology Data Relay
d. BUOY - Oceanographic Drifting Buoy Data
e. BUOYS - Arctic Drifting Buoys
f. Cloud Cover
g. GTCT - Global Tropical Cyclone Tracks
h. HWS - Historical Wind Speed
i. LAND SYNOPTIC - Surface Land Observations
j. NHECT - Northern Hemisphere Extratropical Cyclone Tracks
k. PIBAL - Pilot Balloon Observations
l. Ozone
m. RAOBS - Radiosonde Observations
n. SATWINDS - Low Level Satellite Wind Measurements
o. SHIP SYNOPTIC - Surface Ship Observations
p. SSMI - Special Sensor Microwave Imager
q. UAGC - Upper Air Gridded Climatology
r. World WeatherDisc©
s. WRN - Wind and Residual Noise
t. Other_____

III. Data Generating Models *{Indicate all items that apply}*

1. Indicate all PHYSICAL oceanographic/littoral data generating models that presently are used to supply input for your model or simulation

a. 3-DTDS - 3-Dimensional Thermal Fields
b. MODAS - Modular Ocean Data Assimilation System
c. OCEANS/DART - Ocean Circulation Evolution Analysis and Nowcast System/Data Assimilation Research Transmission
d. OTIS - Optimum Thermal Interpolation System
e. PIPS - Polar Ice Prediction System
f. POM - Princeton Oceanographic Model
g. SWANS - Shallow Water Analysis and Nowcast System
h. SWAPS - Spectral Wave Prediction System
i. TOPS - Thermodynamic Ocean Prediction System
j. WAM - Wave Model (FNMOC)
k. WAM - Wave Model (NAVOCEANO)
l. Other_____

2. METEOROLOGICAL data generating models that supply input for your model or simulation

a. COAMPS - Coupled Ocean Atmospheric Mesoscale Prediction System
b. DAF - Derived Atmospheric Fields
c. ECMWF - European Centre for Medium-Range Weather Forecasts
d. NOGAPS - Naval Operational Global Atmospheric Prediction System
e. NORAPS - Naval Operational Regional Atmospheric Prediction System
f. Other_____

IV. Further Information and Comments

1. If this part is being filled out for a database or data generating model not listed, please check that you have entered its name in one of the above lists (under other).

2. Identify any relevant points of contact for further information on relevant databases or data-generating models.

_____

_____

_____

_____

3. Comments on the survey may be included here.

APPENDIX 4

DATABASES AND DATA GENERATING MODELS FOR POSSIBLE INCLUSION IN PROTOTYPE AND LONG TERM MEL: PRELIMINARY RESULTS

List of Relevant Data Bases for Possible Inclusion in MEL

Physical Oceanographic Data Bases				
Time-Invariant Data Bases				
Name	**Acronym**	**Source**	**Parameters**	**Description/Comments**
	ATLAST	JPL	Pot.Temp. , Pressure, O2, S, Density, Phosphate, Nitrate, Si	Global areal coverage.
Advanced Very High Resolution Radiometer (1)	AVHRR (1)	NRL	SST	Global, weekly coverage from 1982 to 1990. Spatial resolution is 18 km.
Dynamic GDEM	DGDEM	NAVOCEANO	T, S, SS	Developed for specific small regions.
Generalized Digital Environmental Model Data Base	GDEM	COMNAVMETOCCOM	T, S, SS	U.S. Navy standard oceanographic climatology from 1902 to present with 1/2-degree horizontal resolution, 36 vertical levels and four seasons. Coverage is regional (N.Atl., N.Pac., Med., Indian), and is limited to areas 400 m or greater in depth.
Under Ice Roughness and Ridge Frequency Data Base	ICECAP	COMNAVMETOCCOM	Ice Thickness, Ice Keel	Digital ice profile statistics from several submarine cruises forecast or updated every 3 years. Spatial coverage includes from 60° to 90°N with spatial resolution of 1° lat. by 2.5° long. from 1977-1991.
Levitus		NOAA	T, S, O2, DO, Potential Temp, BV freq., Potential Density	Global coverage for four seasons. Spatial resolution is 1° (horiz.), with 33 vertical levels.
ONR Shallow Water Data Base	ONRSWDB	ONR	T, S	Regional coverage for four seasons. Spatial coverage is northern hemisphere, non-U.S. coastal areas with spatial resolution of 5 min. in horizontal.
Shea-Trenberth-Reynolds SST	STR SST	NCAR	SST	Global coverage with spatial resolution of 2° x 2° and monthly temporal resolution.
Wave Data	WISWAVE	CERC	Significant Wave Height, Peak Wave Period, Peak Wave Direction	Hindcast modeled data for each 3 -hours for period 1956-1975. One quarter degree intervals in 10 m water depth along coastline.
Wave Data	WISWAVE	CERC	Directional Wave Energy Spectrum (horiz. position, freq, dir, time)	Hindcast modeled data for each 3-hours for 1956-1975. Twenty spectral bands, 16 direction bands. Spatial coverage is Atlantic, Great Lakes, and southern California.

Time-Evolving Data Bases				
Advanced Very High Resolution Radiometer (2)	AVHRR (2)	NRL	SST	Regional scenes from 1993 to the present. Spatial coverage is Gulf of Mexico and Arabian Sea with scenes of 1 km.
Advanced Very High Resolution Radiometer (3)	AVHRR (3)	NRL	Turbidity (c(660))	Coastal Gulf of Mexico coverage from April 1994 to present, with spatial resolution of 1 km.
Bathythermograph Soundings	BATHY	FLENUMMETOCCEN	Conductivity, Salinity, T, Water Depth	Global point data taken from XBT's and CTD's for 1901 to present.
Antarctic Icebergs	BERG	NAVICECEN		Information on tabular icebergs in the southern hemisphere, south of 45° lat. from 1979 to present. Spatial resolution is 10 km.
Oceanographic Drifting Buoy Data	BUOY	FLENUMMETOCCEN	Drift and Wind Speed and Direction, Air Temp., Dew Point, Humidity, P, Sea-level Press., Pressure Tendency, S, T, Wave Period, Wave Height, Water Depth	Global data bank of data reported from oceanographic drifting buoys for 1901 to present.
Coastal Engineering Data Retrieval System	CEDRS	CERC	Wave Height/Period/Direction, Wind Speed/Direction	Hindcast and measured data from 1956 to present. Hindcast data are from Wave Information Studies (WIS) which are time series produced from a computer hindcast model. Coverage is the Atl. and Gulf of Mexico, with future coverage the Pac. and Great Lakes.
Front and Eddy Composite v1.0	COMPOSITE v1.0	NAVOCEANO	T	Both observed and extrapolated limits combined to display the complete front position and boundaries of water masses from 1988 to present. Spatial coverage is N.Atl., N. Pac., W. Indian, Med. Sea,and GIUK with spatial resolution of 1.1 km.
Front and Eddy Analysis	DAILIES	NAVOCEANO	T, Surface Frontal Positions of Currents and Eddies	Surface position of ocean features derived from AVHRR / IR satellite imagery for 1988 to present. Spatial coverage is N.Atl., N. Pac., W. Indian, Med. Sea,and GIUK with spatial resolution of 1.1 km.

Geostationary Operational Environmental Satellite Imagery	GOES	NRL-MRY	SST	Regional imagery available every 30 minutes for both visible (1 km) and IR (4 km).
Sea Ice Climatology	ICECLIMO	COMNAVMETOCCOM	Maximum, Mean, and Minimum Ice edges and extent of 5/10ths or more ice	Ice climatology derived from 23 years of ice analyses in SIGRID database. Provides global coverage north and south of 45° lat. from 1972 to present with spatial resolution of 15 nmi.
Multi-Channel Sea Surface Temperature	MCSST	NAVOCEANO	SST	From Advanced Very High Resolution Radiometer (AVHRR) on board NOAA polar-orbiting satellites. Global coverage with 8 km spatial resolution.
Master Oceanographic Observation Data Set	MOODS	NAVOCEANO	D, S, P, SSP	Global coverage of observed data and vertical profiles of D/T point data from 1901 to present. Includes much of NODC historical profiles. Classified.
NODC Historical Temp. & Salinity Profiles		NOAA/NODC	T, S	Global historical data at varying spatial resolutions.
Salinity Geophysics Bathymetry Temperature	SAGEBATE	NAVOCEANO	Bathymetry, SST, Magnetics, 6 Seismic Horizons	Global coverage with spatial resolution of 0.0001° lat. & long. from 1967 to present.
Enhanced Satellite Imagery	SATMSG	NAVOCEANO	SST	High-resolution IR satellite imagery from the AVHRR sensor aboard polar orbiting satellites. Spatial coverage is N.Atl., N. Pac., W. Indian, Med. Sea,and GIUK with spatial resolution of 1.1 km.
Surface Currents Data Base	SCDB	NAVOCEANO	SS, V, T	Multinational observations of surface current derived from ship set and drift. Spatial coverage is global point data mostly along shipping lanes.
Surface Ship Observations	SHIP SYNOPTIC	FLENUMMETOCCEN	Wind Speed and Direction, Humidity, Sea-Level Pressure, T, Precipitation, Cloud Height, Sea Height, Swell	Surface weather point data taken from ship stations retained up to 30 days.
Sea Ice Gridded Data	SIGRID	WDC-A / NSIDC	Satellite Imagery, Drifting Buoys, Aerial Reconnaissance	Derived from weekly Arctic and Antarctic ice analyses, and reside in compacted raster format known as SIGRID. Spatial coverage is north of 45°N and south of 45°S with spatial resolution of 15 nmi from 1972 to present.

Standard Navy Altimetry Record	SNAR	NAVOCEANO	SSH, WS/WD, WH, Ice edges	Global data bank with a satellite dependent spatial resolution with ground track spacing plus 7 km along track. Updated every 1 to 10 hours. Data not retained.
Subsurface Currents Data Base	SSCDB	NAVOCEANO	Velocity, T, Water Depth	Global data base primarily of coastal areas containing point data from 1960 to present.
Wave Data		NOAA	Significant Wave Height, Mean Wave Period, Dominant Wave Period, Wave Spectrum	Measured by NOAA wave buoys.
Wave Data		CERC	Wave Spectrum	Measured by CERC buoys, pressure gauges, etc.
Bathymetry				
Data Generating Models				
3-DIMENSIONAL THERMAL FIELDS	3-D TDS	NAVOCEANO	Thermal Field	Gridded fields from optimal interpolations for selected regions. Data from MCSST's, BT's, drifting buoys, etc. are assimilated into climatological start-up fields.
Advanced Circulation	ADCIRC	CERC	Sea-surface Elevation, Depth-averaged Tidal Currents	Finite element regional oceanographic model with very high resolution on the continental shelf and slope waters. Spatial resolution is 100 m to 10 km.
Data Assimilation Reserach Transmission	DART (Gulf Stream)	FLENUMMETOCCEN	Dynamic Height	Forecasts up to 7 and 14 days for the Gulf Stream region with spatial resolution of 1/8°. Updated 3 times per week.
Expanded Ocean Thermal Structure	EOTS	FLENUMMETOCCEN	Thermal Fields	Regional ocean thermal nowcast model using variational technique called Fields-by-Information-Blending (FIB).
Global Spectral Ocean Wave Model	GSOWM	FLENUMMETOCCEN	Direction Wave Energy Spectra	Global forecasts of directional wave energy spectra from which significant wave height, primary wave period, and primary wave direction are derived. Uses forcing provided by NOGAPS.
Modular Ocean Data Assimilation System	MODAS	NAVOCEANO	Temperature, Salinity, Sound Speed	High resolution 3-D gridded fields from optimum interpolation. Restricted to deep water applications.

Optimum Thermal Interplation System	OTIS	FLENUMMETOCCEN	Dynamic Height, Salinity, Temperature, Temperature Anomalies, Temp. Errors	Global (SST only) and regional (Gulf Stream, Kuroshio, Greenland, Iceland, Norwegian Sea (GINS)) 3-D nowcast fields. Spatial resolutions are 1° (global) and 0.2° (regional) and updates occur on 12-hour (global) and 24-hour (regional) cycles.
Polar Ice Prediction System	PIPS	FLENUMMETOCCEN	Arctic Ice Drift, Thickness, Concentration, Divergence/Convergence, Ice Growth, Strength	Gridded forecasts (up to 120 hours) of the Arctic Basin, Barents Sea, and Greenland Sea updated on 1-week cycles. Spatial resolutions are 127-km grid cells (Arctic Basin) and 20- to 30-km grid cells (regional).
Princeton Model	POM	Princeton	Circulation	Multi-level primitive equation ocean circulation model. Includes atmospheric and tidal forcing and is designed specifically for high resolution shallow water applications. Model is run for Persian Gulf and Red Sea. Atl., Pac., Indian for future.
Shallow Water Analysis and Nowcast System	SWANS	NAVOCEANO	Temperature, Salinity, Sound Speed, Mixed Layer Depth	Optimum interpolation real-time data assimilator coupled with the Princeton Model. Implemented in semi-enclosed seas dominated by shallow water.
Spectral Wave Prediction System	SWAPS	NAVOCEANO	Spectral Surface Gravity Waves	Spectral surface gravity wave prediction system, consisting of a two-dimensional spectral wave model (WAM), tailored to those semi-enclosed seas for which NAVOCEANO has twice daily forecast responsibility. Coverage is Med. Sea.
Thermodynamics Ocean Prediction System 4.0	TOPS 4.0	FLENUMMETOCCEN	Upper Ocean Temperature, Thermal Fields, Derived Surface Currents	Global and regional (Gulf Stream, Kuroshio) forecasts to 36-hours minimum, 72-hours maximum. Spatial resolutions are 1° (global) and 0.2° (regional). Updated daily.
Wave Model	WAM	FLENUMMETOCCEN	Directiona Wave Energy Spectra, Derived Significant Wave Height, Mean Period, Peak Direction, Sea and Swell Heigh, Period, Direction	Global forecast to 72 hours and regional forecasts of Indian Ocean, Med. Sea, and Korean region to 48 hours. Spatial resolutions are 1° (global) and 0.2° to 25° (regional).
Wave Model	WAM	NAVOCEANO	Wave height, Period, Direction, Directional Energy Spectra	Gridded analysis and forecast of the previous parameters and has a spatial coverage of selected regions (dependent on requirements) that is forecast every 48 hours and updated 2 times per year.

Metadata Data Bases				
DATA SET METADATA DATABASE		Marine Corps M&S Management Office		Incorporated into the AAAV Sources Relational Database.
DATA ELEMENT METADATA DATABASE		Marine Corps M&S Management Office		Incorporated into the AAAV Sources Relational Database.
MODEL/SIMULATION METADATA DATABASE		Marine Corps M&S Management Office		Incorporated into the AAAV Sources Relational Database.

Geophysical Oceanographic Data Bases

Time-Invariant Data Bases

Name	Acronym	Source	Parameters	Description/Comments
Digital Bathymetric Data Base - 1	DBDB-1	DMA	Water Depth	Depths for every oceanic geographic position evenly divisible by 1 minute of latitude and longitude in selected areas. Present (1995) coverage is Med. Sea and southern California.
Digital Bathymetric Data Base - 2	DBDB-2	DMA	Water Depth	Depths for every oceanic geographic position evenly divisible by 2 minutes of latitude and longitude in selected areas. Present (1995) coverage is the Med. Sea, Red Sea, Persian Gulf, and northern Gulf of Oman.
Digital Bathymetric Data Base - 5	DBDB-5	DMA	Water Depth	Depths for every oceanic geographic position evenly divisible by 5 minutes of latitude and longitude in selected areas. Present (1995) coverage is all ocean areas north of 78°S.
Digital Bathymetric Data Base - C	DBDB-C	DMA	Water Depth	Depths provided for every oceanic geographic position evenly divisible by 5 minutes of latitude and longitude in selected areas. Spatial coverage is all ocean areas north of 78°S. (CONFIDENTIAL)
15" Bathymetry	TOPO15	NOAA/NOS	Bathymetry	15" soundings sporadic throughout coastal waters of CONUS.
5' Topography	ETOPO5	NOAA/NGDC	Depth, Elevation	Global coverage with spatial resolutions of 5 min. (horiz.) and 1 m (vertical).
TerrainBase		NOAA/NGDC	Depth, Elevation	Updated ETOPO5 which provides global coverage at higher resolutions.
30" Topography	TOPO30	USGS/NOAA	Bathymetry, Hypsography	30" postings of entire CONUS which can be intersected with ETOPO5 at a 30" sampling to form higher resolution TOPO data set.

World Vector Shoreline	WVS	DMA	Shoreline Position	High-resolution, vectorized global coverage.
World Vector Shoreline Plus	WVS Plus	DMA	Shoreline Position	High-resolution, polygonized global coverage.
Time-Evolving Data Bases				
Arc Digitized Raster Graphics	ADRG	DMA	Underwater Obstructions, Water Depth, Tidal Currents, Vegetation, Bottom Materials Type, Shoreline Position, Population Centers, Waterways, Railroads, Physiographic Features	Digital raster representations of hardcopy charts, such as Navigation Charts, City Maps, Pilotage Charts, Combat Charts, and Nautical Charts. Available for most CONUS areas.
Bathythermograph Soundings	BATHY	FLENUMMETOCCEN	Conductivity, Salinity, T, Water Depth	Observations of subsurface temperatures taken from expendable bathythermographs for 1901 to present.
Oceanographic Drifting Buoy Data *	BUOY	FLENUMMETOCCEN	Drift and Wind Speed and Direction, Air Temp., Dew Point, Humidity, P, Sea-level Press., Pressure Tendency, S, T, Wave Period, Wave Height, Water Depth	Global data bank of data reported from oceanographic drifting buoys from 1901 to present.
Digital Chart of the World	DCW	DMA	Coastlines, Populated Places, Road and Rail Networks	Global coverage at map scale of 1:1,000,000.
Digital Feature Analysis Data	DFAD	DMA	Lines of Communication, Waterways/Rivers, Urban Areas, Surface Material, Vegetation, Roads/Railroads	Global coverage in grid sizes of 1°x 1°, 2 x 2 nmi, and 10 x 10 nmi.
Digital Nautical Chart	DNC	DMA	Surface Material, Waterways/Rivers, Obstructions, High-water Line	Plans to provide global coverage, but presently provides specific local coverage. The spatial coverage includes Hampton Roads and Virginia Capes test areas, as well as New York Harbor.
Digital Terrain Elevation Data	DTED	DMA	Terrain Elevation, Slope, Surface Roughness	Global coverage in grid sizes of 1° x 1°.
Coastal Shoreline		NRL	Coastal Shoreline Position	Global coastal shoreline positions with spatial resolutions of 0.2 km.

Interim Terrain Data	ITD	DMA	Surface Material, Slope, Vegetation, Transportation, Obstacles	Limited regional coverage. Present (1995) coverage is parts of the Middle East, Central Europe, and Korea. Central America, SE Asia, and the U.S. are planned for future.
NOS 80K Shoreline	NOS80	NOAA/NOS	Shoreline Position	Spatial coverage is entire east coast, Gulf of Mexico, and Great Lakes. New CONUS sub-sets being developed.
Salinity Geophysics Bathymetry Temperature *	SAGEBATE	NAVOCEANO	Bathymetry, SST, Magnetics, 6 Seismic Horizons	Global coverage with spatial resolution of 0.0001° lat. & long. from 1967 to present.
Special Sensor Microwave Imager	SSMI	FLENUMMETOCCEN	Land Surface Type and Temp., Snow Extent, Snow Depth, Soil Moisture, Ocean Surface Wind Speed, Ice Concentration, Ice Age, Water Vapor, Rain Rate	Global data bank of parameters derived from multifrequency microwave SSMI. Data retained up to 30 days.
SYNBAPS Bathymetry	SYNBAPS	NRL	Water Depth	Global coverage with spatial resolution of 10 km.

Acoustical Oceanographic Data Bases

Time-Invariant Data Bases

Name	Acronym	Source	Parameters	Description/Comments
Dynamic GDEM *	DGDEM	NAVOCEANO	T, S, SS	Developed for specific small regions.
Generalized Digital Environmental Model Data Base *	GDEM	COMNAVMETOCCOM	T, S, SS	U.S. Navy standard oceanographic climatology. It has 1/2-degree horizontal resolution, 36 vertical levels and four seasons. Coverage is regional (N.Atl., N.Pac., Med., Indian), and limited to areas 400 m or greater in depth. Will include shallow water.
Historical Temporal Shipping	HITS	COMNAVMETOCCOM	Surface Shipping Density, Type	Covers ocean areas between 60°S and 80°N with a spatial resoltuion of 1° arc of lat. by 1° arc of long. from 1978 to 1990. Updated every 2 years.

Time-Evolving Data Bases

Bottom Backscatter	BBS	NAVOCEANO	Sound-Source Type (SUS, CW, etc.), Weight or Pulse, Water Depth, Receiver Depth, Frequency, Beam Angle, Grazing Angle, and Scattering Levels	Point data from the N. Atl., and Med. Sea updated every 6 months. Temporal coverage is from 1967 to present.
High-Frequency Bottom Loss	HFBL	COMNAVMETOCCOM	Geoacoustic Provinces, Sediment Thickness, Bottom Loss, Grazing Angle	Reflective and refractive characteristics of ocean bottoms for frequencies 1.5 kHz to 4.0 kHz. Spatial coverage is selected areas of the Atl., Pac., Indian, Arctic, and Med. Sea from 1985 to present with spatial resolution of 5 min. lat. & long.
Low-Frequency Bottom Loss	LFBL	COMNAVMETOCCOM	Sediment Thickness, Bottom Loss, Grazing Angle	Reflective and refractive characteristics of the ocean bottom. Spatial coverage is selected areas of the Atl., Pac., Indian, Arctic, and Med. Sea from 1985 to present with spatial resolution of 5 min. lat. & long.
Master Oceanographic Observation Data Set	MOODS	NAVOCEANO	D, S, P, SSP	Global coverage of observed data and vertical profiles of point data from 1901 to present.

Shipping Noise - Directional Ambient Noise	SN - DIAN	COMNAVMETOCCOM	Shipping Noise	Estimated horizontal directional shipping noise in N. Atl. and N. Pac. from 1985 to present. Limited to water depth greater than 1200 ft. Spatial resolution is 1° lat. & long. with 1.5° for Med Sea.
Shipping Noise - Historical Ice-Edge	SN - HIE	COMNAVMETOCCOM	Shipping Noise	Monthly mean ice edge and the surrounding Marginal Ice Zone (MIZ) of parts of the western Pacific and Arctic. Spatial resolution is 5 min. lat. & long. with coverage from 1986 to present.
Shipping Noise - Low Resolution Shipping Noise	SN - LRSN	COMNAVMETOCCOM	Shipping Noise	Estimated omnidirectional and horizontally directional shipping noise and spectra for selected areas of the N. Atl., N. Pac., Indian, and Norwegian Sea, from 1985 to present.
Volume Scattering Strength	VSS	COMNAVMETOCCOM	Column Scattering Strength	Integrated scattering strength data by season on 5° square grid cells. Spatial coverage is 80°S to 90°N from 1979 to 1994. Updated every 6 months.
Data Generating Models				
Modular Ocean Data Assimilation System *	MODAS	NAVOCEANO	Temperature, Salinity, Sound Speed	High resolution 3-D gridded fields using optimum interpolation. Restricted to deep water applications.
Shallow Water Analysis and Nowcast System *	SWANS	NAVOCEANO	Temperature, Salinity, Sound Speed, Mixed Layer Depth	Optimum interpolation real-time data assimilator coupled with the Princeton Model. Implemented in semi-enclosed seas dominated by shallow water.

Optical Oceanographic Data Bases				
Time-Invariant Data Bases				
Name	**Acronym**	**Source**	**Parameters**	**Description/Comments**
Advanced Very High Resolution Radiometer (1) *	AVHRR (1)	NRL	SST	Global, weekly coverage from 1982 to 1990, with spatial resolution of 18 km.
Coastal Zone Color Scanner (1)	CZCS (1)	NRL	Chlorophyll, k(490)	Global, monthly coverage from 1978-1986 with swath width of 18 km.
Coastal Zone Color Scanner (2)	CZCS (2)	NRL	Chlorophyll, k (490), 4 Spectral Radiance Aerosols (670 nm)	Regional imagery from 1978 to 1986. Spatial coverage is Arabian Sea, Sea of Japan, and Gulf of Mexico with a spatial resolution of 1 km.
Time-Evolving Data Bases				
Advanced Very High Resolution Radiometer (2) *	AVHRR (2)	NRL	SST	Regional scenes from 1993 to the present. Spatial coverage is the Gulf of Mexico and the Arabian Sea with resolution of 1 km.
Advanced Very High Resolution Radiometer (3) *	AVHRR (3)	NRL	Turbidity (c(660))	Coastal Gulf of Mexico coverage from April 1994 to the present, with a spatial resolution of 1 km.
Solar Irradiance		NRL	Solar Irradiance at Sea Surface	Regional, monthly coverage from 1979 to 1982. Spatial coverage is the North Atlantic, Arabian Sea, and Pacific with a spatial resolution of 18 km.

Biological Oceanographic Data Bases				
Time-Invariant Data Bases				
Name	**Acronym**	**Source**	**Parameters**	**Description/Comments**
Coastal Zone Color Scanner (1) *	CZCS (1)	NRL	Chlorophyll, k(490)	Global, monthly coverage from 1978 to 1986 with a swath width of 18 km.
Coastal Zone Color Scanner (2) *	CZCS (2)	NRL	Chlorophyll, k (490), 4 Spectral Radiance Aerosols (670 nm)	Regional imagery from 1978 to 1986. Spatial coverage is the Arabian Sea, Sea of Japan, and Gulf of Mexico with a spatial resolution of 1 km.
Time-Evolving Data Bases				
Interim Terrain Data *	ITD	DMA	Surface Material, Slope, Vegetation, Transportation, Obstacles	Limited regional coverage. Present (1995) coverage is parts of the Middle East, Central Europe, and Korea. Central America, SE Asia, and U.S. are planned for future.

Meteorological / Air-Sea Interaction Data Bases

Time-Invariant Data Bases

Name	Acronym	Source	Parameters	Description/Comments
3-Dimensional Nephanalysis	3DNEPH	USAETAC	Percent Cloud Coverage,Cloud Type(low,middle,high),Min.Cloud Base,Total Coverage,Cloud Base,Cloud Top,Weather Report	Worldwide coverage of the Northern Hemisphere from 1/73 to 12/83, and Southern Hemisphere from 1/77 to 12/83. Resolution 513x513 polar stereograph, 26 nm at 60°, 15 layers (6 layers: surface-3,500 ft; 9 layers: surface-40,000 ft).
3-Dimensional Nephanalysis - Low,Middle,High Type/Amount	3DNEPH-LMHT/A	USAETAC	Cloud Type and Amount (low,middle,high),Total Cloud Coverage	Worldwide coverage of the Northern Hemisphere from 1/73 to 12/83, and Southern Hemisphere from 1/77 to 12/83. Resolution 512x512 polar stereograph, 26 nm at 60°.
AGROMET	AGROMET	USAETAC	Temperature, Moisture, Radiation, etc.	Geographic coverage is all land areas.
Cloud Cover		NRL	Cloud Cover	Regional, monthly images from 1978 to 1986. Spatial coverage is the Pacific Ocean and Arabian Sea, with a spatial resolution of 18 km and temporal resolution of 3 hours.
Coarse Mesh Upper-Air		USAFETAC	Wind Component(u,v), D-Value, Sea Level Pressure,Temperature,Dew Point Temperature,U-V Cross Product,Density	Worldwide coverage from 1/77-12/84. Resolution 65x65 polar stereograph, 206 nm at 60°; tropical strip 73x19 mercador. Mandatory pressure levels (surface, 1000,850,700,500,400,300,250,200,150,100,70,50, 30, 20, and 10 MB).
Historical Wind Speed	HWS	COMNAVMETOCCOM	Surface Wind Speed Statistics	Monthly global ocean surface wind statistics from 1946 to 1986, with a spatial resolution of 1° latitude and longitude.
Liquid Water Content		USAFETAC	Cloud Type(low,middle,high), Total Cloud Amount, Weather, Cloud Base, Cloud Top, Temperature, Density, Ice Content(Cloud&Rain), Liquid Content(Cloud&Rain)	Coverage of Northern Hemisphere from 1/77 to 12/80. Resolution 15 layers (6 layers: surface-3,500 ft; 9 layers: surface-40,000 ft).

Ozone		NRL	Ozone Concentration	Global coverage from 1978 to 1986 with a spatial resolution of 50 km.
Ozone Data		USAFETAC	Total Amount of Ozone, Ozone Partial Pressure, Air Temperature, Wind Direction, Wind Speed	Coverage from 1/57 to 12/80.
Summarized Coarse Mesh Analysis (UAPIP)		USAFETAC	Wind Component (u,v), D-Value, Sea Level Pressure, Temperature, Dew Point Depression, U-V Cross Product, Density, Summation	Worldwide coverage from 1/77 to 12/83. Spatial resolution 65x65 polar stereograph, 206nm at 60°. Mandatory pressure levels (surface, 1000, 850, 700, 500, 400, 300, 250, 200, 150, 100, 70, 50, 30, 20, and 10mb).
Surface Wind		NMC/FNMOC	Wind Direction/Speed	Computed from pressure fields at WISWAVE grid points. Average wind at 10 m elevation.
TDF-13 (Foreign Synoptic)		USAFETAC	Wind Dir/Speed, Barometric Pressures, Pressure Tendency and Change, Temperature(dry bulb, dew point), Visibility, Total Sky Cover, Cloud Layer Data, Present Weather	Worldwide (not U.S.) coverage from 1901-1971 for 6.000 foreign stations.
TDF-14 (Airways/METAR)		USAFETAC	Wind Dir/Speed, Barometric Pressures, Pressure Tendency and Change, Temperature(dry bulb, dew point), Visibility, Ceiling, Cloud Layer Groups, Present Weather	Worldwide coverage from 1929-1970 for 2,566 stations.
TDF-34 (Summary of the Day)		USAFETAC	Temperature(mean,min,max), Peak Wind, Precipitation, Snowfall, Snow Depth, Days with thunderstorms, sleet, hail, dust, smoke, snow, blowing snow, rain, fog	Worldwide coverage from 1890-1992 for 1,795 stations.
TDF-35 (West German Summary)		USAFETAC	Temperature (mean,min,max), Total Precipitation, Sunshine Hours, Snow Cover, Thunderstorms	West Germany coverage from 1953-1980 for 116 West German stations.
TDF-52 (Foreign PIBAL)		USAFETAC	Wind Speed, Wind Direction	Worldwide (not U.S.) coverage from 1922-1970 for 1,217 foreign stations.

TDF-53 (Worldwide Winds Aloft)		USAFETAC	Wind Speed, Wind Direction	Worldwide coverage from 1919-1965 for 1,660 stations with varying levels.
TDF-54 (Worldwide Radiosonde)		USAFETAC	Height, Temperature, Pressure, Relative Humidity, Wind Direction, Wind Speed	Worldwide coverage from 1930-1970 for 1,170 stations with varying levels.
TDF-56 (Worldwide Rawinsonde)		USAFETAC	Height, Temperature, Pressure, Relative Humidity, Wind Direction, Wind Speed	Worldwide coverage from 1946-1970 for 699 stations. Mandatory pressure levels (surface, 1000,850,700, 500,400,300,250,200,150,100,70,50,30,20, 10mb).
TDF-57 (Worldwide RECCO, Dropsonde, Flight Weather)		USAFETAC	Height, Wind Direction, Wind Speed, Temperature, Cloud Data, Pressure	Worldwide coverage from 1947 to 1958.
Wind and Residual Noise	WRN	COMNAVMETOCCOM	Spectra for Wind-Generated Noise, Presence of Transient and/or Residual Noise Sources	Spatial coverage of the N.Atl., Norwegian Sea, Indian Ocean, and Med. Sea from 1985 to 1989 and is updated twice a year.
World WeatherDisc		WeatherDisc Associates, Inc. Seattle, WA	Air Temp., RH, Dew Pt., Precip., Winds, Storms, SST, Daily Weather Obs., Sunshine Data, etc.	Six global and 11 U.S. data sets of varying spatial and temporal resolutions.
Time-Evolving Data Bases				
Aircraft Reports	AIREPS	FLENUMMETOCCEN	Upper Level Winds, Temp.	Global point data reported from aircraft of opportunity and retained up to 30 days.
Surface Aviation Observations	AIRWAYS	FLENUMMETOCCEN	Air Temperature, Dew Point, Winds, Pressure, Altimeter, Clouds	Surface weather reports from CONUS airport locations, as well as Alaska, Canada, Hawaii, and Mexico. Observations retained for 30 days, and updated hourly.
Aircraft Meteorology Data Relay	AMDAR	FLENUMMETOCCEN	Flight level, Location, Pressure, Air Temperature, Dew Point, Humidity, Wind Speed and Direction, Turbulence, Vertical Gusts	Automated meteorological observations from aircraft of opportunity. Global coverage of point data retained up to 30 days.

Boundary Layer Windows		USAETAC	Wind Component(u,v,w), Temperature, D-Value,Height Above Mean Sea Level, Humidity (specific,relative),Specific Moisture,Fractional Wind Field(u,v).	Coverage of U.S.,Europe from 1/77-present; Asia from 1/77-12/77 and 4/81-present. Resolution 29x27 U.S. or 29x35, 103 nm at 60°, eight levels (surface,50,150,300,600,900,1200, and 1600 meters).
Oceanographic Drifting Buoy Data *	BUOY	FLENUMMETOCCEN	Drift and Wind Speed and Direction, Air Temp., Dew Point, Humidity, P, Sea-level Press., Pressure Tendency, S, T, Wave Period, Wave Height, Water Depth	Global data bank of data reported from oceanographic drifting buoys for 1901 to present.
Arctic Drifting Buoys	BUOYS	WDC-A / NSIDC	Positions, Barometric Pressure, Air Temp.	Spatial resolution of 300 m from 1979 to present with northern hemisphere polar region coverage.
	DATSAV2	USAFETAC	Wind Dir/Speed, Pressure, Temp/Dew Point Temp, Total Sky Cover, Visibility, Past & Present Weather, Cloud Layer Data, Ceiling, Precip, Runway Data, Ship Data	Global surface point data for 13,000 stations.
	DATSAV Airfcraft	USAFETAC	Wind Dir/Speed, Temp, Dew Point Depression, Turbulence, Icing Data, Cloud and Contrail Data, Weather, Flight Visibility, Radar Data, D-Value, Altitude of Mandatory Pressure Level	Worldwide coverage from 10/75 to present. Greatest concentration resolution over U.S. and along major air routes.
	DATSAV Rocketsonde	USAETAC	Height, Temperature, Pressure, Wind Direction, Wind Speed, Density	Worldwide coverage from 10/75 to present. Resolution is altitude of 20 km to 60 km.

	DATSAV Satellite	USAETAC	Height, Temperature, Wind Direction, Wind Speed	Worldwide coverage from 10/75 to present. Resolution from surface to 10 mb.
	DATASAV UPPER AIR	USAFETAC	Pressure, Height, Temp., Dew Pint Depression, Wind Dir/Speed, Cloud Data, SSI, SWEAT Index, Thickness, Precipitable Water, Saturation Moisture Ratio, Turbulence	Global upper air point data from the surface to 10 mb.
Eighth Mesh Surface Temperature		USAFETAC	Surface Temperature	Worldwide coverage from 4/79 to present. Resolution 512x512 polar stereograph, 26 nm at 60°, each synoptic hour.
Global Tropical Cyclone Tracks Data Base	GTCT	FLENUMMETOC DET Asheville	Time, Position, Mode of Movement, Maximum Wind Speed, Sea-Level Pressure, Dvorak T-Number, Dvorak CI-Number, Intensity Stage	Consolidation of historical data sources for global tropical cyclones from 1842 to 1992, updated annually. Spatial coverage is parts of the Atlantic, Pacific, and Indian Ocean with 0.1° spatial resolution.
Hellerman-Rosenstein Wind Stress			Wind Stress	
High Resolution Analysis System	HRAS	USAFETAC	Sea-level Pressure, Wind Component (u,v), D-Value, Temperature, Dew Point Depression, Specific Humidity, Tropopause Pressure,Height, Temperature, Vertical Velocity	Worldwide coverage from 1/85 to present. Resolution 2.5x2.5° grid. Mandatory pressure levels (surface, 1000, 850,700,500,400,300,250,200,150,100,70,50, 30,20 and 10 mb).
Surface Land Observations	LAND SYNOPIC	FLENUMMETOCCEN	Wind Speed and Direction, Humidity, Sea-Level Pressure, T, Precipitation, Cloud-Base Height	Global point data of land-station surface weather observations taken at synoptic reporting times.
	NEXRAD	WSI	Reflectivity, Rainfall Intensity	Regional, hourly data from NOAA's Doppler Radar sites at many CONUS locations. Spatial resolution is 1 km.

Northern Hemisphere Extratropical Cyclone Tracks Data Base	NHECT	FLENUMMETOC DET Asheville	Central Pressure, Direction of Movement, Speed of Movement	Northern hemisphere from 1960 to 1993 with 1° resolution, updated annually. Replaces the paper climatic atlas 'Mariners Worldwide Climatic Guide to Tropical Storms at Sea.
Pilot Balloon Observations	PIBAL	FLENUMMETOCCEN	Upper Level Atmospheric Observations	Global atmospheric point data from wind-tracking ballloons retained up to 30 days.
Precipitable Water		USAFETAC	Precipitable Water	Coverage of Northern Hemisphere, North of 20°N from 3/77 to present. Resolution of 65x65 polar stereograph, 206 nm at 60°.
Radiosonde Observations	RAOBS	FLENUMMETOCCEN	Upper Air Temp., Winds, Humidity	Global point data taken at mandatory and significant reporting levels twice daily and retained up to 30 days.
Real-Time Nephanalysis	RTNEPH	USAFETAC	Cloud Type, Percent Coverage, Min/Max Cloud Base, Total Cloud Coverage, Present Weather Report, Visibility	Global data available every synoptic hour. Spatial resolution is 512 x 512 polar stereographic, 26 nmi at 60°.
Real-Time Nephanalysis-Low, Middle, High Type/Amount)	RTNEPH-LMHT/A	USAFETAC	Cloud Type and Amount (low,mid, high), Total Cloud Coverage	Worldwide coverage from 1/84 to present. Spatial resolution is 512 x 512 polar stereographic, 26 nmi at 60°.
Low Level Satellite Wind Measurements	SATWINDS	FLENUMMETOCCEN	Winds	Wind data of approximately 1/8 of earth's surface from geosynchronous orbits from cloud-drift sensors on GOES,GMS, METEOSAT, and INSAT satellites. Spatial resolution is 2-5 km under satellite tracks, with updates every 30 min. Data retained up to 30 days.
Surface Ship Observations	SHIP SYNOPTIC	FLENUMMETOCCEN	Wind Speed and Direction, Humidity, Sea-Level Pressure, T, Precipitation, Cloud Height, Sea Height, Swell	Global surface weather observations taken from ship stations retained up to 30 days.
Snow/No Snow		USAFETAC	Presence of Snow and Ice	Coverage of parts of the Northern and Southern Hemispheres from 12/75 to present. Spatial resolution 513x513 polar stereograph, 26 nm at 60°, divided into boxes of 64x64 grid points.

Special Sensor Microwave Imager *	SSMI	FLENUMMETOCCEN	Land Surface Type and Temp., Snow Extent, Snow Depth, Soil Moisture, Ocean Surface Wind Speed, Ice Concentration, Ice Age, Water Vapor, Rain Rate	Parameters derived from multifrequency microwave SSMI. Spatial resolution is 25 km. Global coverage.
Trajectory Bulletins		USAFETAC	Temperature (850,700,500 mb), Gradient Temperature, Dew Point (850,700,500 mb), Cloud Cover (850,700,500 mb)	Northern Hemisphere coverage from 1/77 to present for 121 locations. 21 separate paths at 6,12,18,24,30, 36, and 48 hour forecasts.
Tropopause		USAFETAC	Pressure at Tropopause, Height of Tropopause, Temperature at Tropopause	Worldwide coverage from 1/77 to present for Northern Hemisphere and tropical strip, and 4/81 to present for Southern Hemisphere.
Upper-Air Windows		USAFETAC	Wind Component (u,v), D-Value, Temperature, Dew Point Depression, Surface Pressure, SWEAT Index	Coverage of Asia, Europe, North America from 1/77 to present. Resolution for North America: 37x39 window, for Asis and Europe: 35x41 window, 103 nm at 60°N.
Vandenburg Tower		USAFETAC	Wind Direction, Wind Speed, Temperature, Pressure, Vertical Temperature Differential	Coverage north of 20°N and south of 20°S from 1/77 to present. Resolution 65x65 polar stereograph, 206 nm at 60°.
Data Generating Models				
Coupled Ocean Atmosphere Mesoscale Prediction System	COAMPS	NRL-MRY	Water Vapor, Rain, Ice Crystals, Snow	Non-hydrostatic, regional, atmospheric model, run in triple nested mode (i.e., 81,27,9 km). Spatial resolution is 5-9 km.
Derived Atmospheric Fields	DAF	FLENUMMETOCCEN	Clear Air Turbulence, Contrail Probability, Fog, Frontal Analysis, Freezing Height, Rain Rate, Relative Humidity	Global forecasts to 60, 72, or 96 hours, updated on 12-hour cycle, with spatial resolution of 1°.
High Resolution Winds	HRW	ARL	Temp., Winds, Vertical Velocity, Relative Humidity	Limited area model run for Camp Pendelton and Fort Hunter Ligget regions on a 10 x 10 km grid. Utilizes high resolution terrain data base with outputs at 10, 250, 500, and 1000 m. Spatial resolution is 200 m.

Naval Operational Global Atmospheric Prediction System	NOGAPS	FLENUMMETOCCEN	Abs. Vort, Air Temp, Conv. Clouds, Conver. Precip., Diver.,Dew-Pt Depress,Geopot. Ht.,Ground Wetness,SST,Ice Cover,Lifting Conden. Level,IR Flux, Latent, Sens.,and Tot. Heat Fluxes,Snow Depth,Wind Dir/Speed/Stress,Sfc Press.,Solar Rad.,Cloud Cov.,Tot.Prec	Global, spatial resolution of 82 km. Forecast provided to 120 hours and distributed on a 12-hour cycle.
Naval Operational Regional Atmospheric Positioning System	NORAPS	FLENUMMETOCCEN	Air Temp, Geopotential Height, Surface Pressure, Total Precip, Wind Dir/Speed, Absolute Vorticity, Conv. Precip, Latent, Sensible, and Total Heat Fluxes, Solar Radiation, Vapor Pressure	Atmospheric forecast (up to 48 hours) model that can be run for any user-specified are in the world. Current regions include CONUS, Europe, Indian Ocean, and Asia. Spatial resolution is currently 45 km.

APPENDIX 5

M&S ENVIRONMENTAL REQUIREMENTS SURVEY

PRELIMINARY RESULTS (20 SURVEYS)

SURVEY PARTICIPANTS (as of 11/1/95)

LAST NAME	FIRST NAME	ORGANIZATION	ADDRESS	CITY	STATE	ZIP CODE	PHONE	FAX	EMAIL
Baer	Wolfgang	Naval Postgraduate School	Naval Postgraduate School, Code CS	Monterey	CA	93924	408-656-2209		baer@cs.nps.navy.mil
Bourke	Robert	Naval Postgraduate School	NPGS, Dept. of Oceanography	Monterey	CA	93943	408-656-2673	408-656-2712	
Bourke, Jr.	Rob	Naval Postgraduate School	NPGS, Dept. of Oceanography	Monterey	CA	93943	408-656-4143	408-656-4142	rkbourke@nps.navy.mil
Braccio	Peter	Naval Postgraduate School	NPGS, Oceanography Dept., Code OC/BC	Monterey	CA	93943	408-656-2217	408-656-2712	braccio@oc.nps.navy.mil
Chenault	Thelma	Army Research Laboratory	AMSRL-SL-CA	White Sands Missile Range	NM	88002-5501	505-678-6579	505-678-8822	tchenaul@arl.mil
Chu	Peter	Naval Postgraduate School	NPGS, Dept. of Oceanography	Monterey	CA	93943	408-656-3257	408-656-3686	chu@nps.navy.mil
Clancy	Michael	Fleet Numerical Met eorology and Oceanography Center	Commanding Officer, FLENUMMETOCCEN, Code 42, 7 Grace Hopper Ave. Stop 1	Monterey	CA	93943-5501	408-656-4414	408-656-4489	clancy@fnoc.navy.mil
Cook	Michael	Naval Postgraduate School	NPGS, Oceanography Dept., 833 Dyer Rd.	Monterey	CA	93943	408-656-1060	408-656-2712	cook@oc.nps.navy.mil
Hodur	Richard	Naval Research Laboratory	7 Grace Hopper Ave.	Monterey	CA	93940	408-656-4788	408-656-4769	hodur@nrlmry.navy.mil
Hubertz	Jon	WES-CERC	CE-WES-CR-0; CERC; 3909 Halls Ferry Rd.	Vicksburg	MS	39180-6199	601-634-2028	601-634-4314	hubertz@coafs1.wes.army.mil
McCann	Mike	Naval Postgraduate School	555 Dyer Rd., Room 130	Monterey	CA	93943	408-656-2752	408-656-2611	mccann@nps.navy.mil
Murphy	Don	USCG, R&D Center	1082 Shennecossett Rd.	Groton	CT	06340-6096	203-441-2635	203-441-2773	d.murphy/iip@cgsmtp.comdt.uscg.mil
Remeika	Michael	U.S. Air Force, Phillips Lab	PL/GPAB, 29 Randolph Rd.	Hanscom AFB	MA	01731-2643	617-377-8892	617-377-8892	remeika@arcuni.plh.af.mil

MASTER ENVIRONMENTAL LIBRARY SURVEY RESULTS
(as of 11/1/95)

PART 1 (13 respondents; 20 surveys)

2. Use environmental data - 13
   Generate environmental data - 13

3. Data type used:
   - deep ocean - 7
   - littoral - 7
   - ocean bottom - 3
   - air-sea interaction - 6
   - atmospheric - 8
   - near space - 1
   - terrain - 5

4. Data type generated:
   - deep ocean - 6
   - littoral - 7
   - ocean bottom - 1
   - air-sea interaction - 5
   - atmospheric - 4
   - near space - 0
   - terrain - 3

5. Primary use or generation of environmental data:
   - input to model/simulation - 12
   - create data via data generating model - 6
   - create database - 4
   - create databank - 5

PART 2 (12 respondents; 19 surveys)

3. Spatial coverage:
   - global - 7
   - regional - 12
   - local - 6
   - coastal/littoral - 5

4. Geographic areas listed:
   U.S. coastline, Western North Atlantic, Fort Hunter Ligget, Central California, California Coastal Current, Leewin Current, Chile, Beaufort Sea, Arctic Ocean (incl. surrounding seas), South China Sea, Northwest Atlantic, Northeast Atlantic, Northwest Pacific, Mediterranean Sea, northern Indian, Korean area, West Coast U.S., Worldwide, Worldwide (mostly littoral)

5. DMSO functional area:
   - R & D - 10
   - T & E - 3
   - P & L - 6
   - Analysis - 8
   - ETMO - 8

6. MEL useful:
    Yes - 6
    No - 1
    Need more info. - 12

II-1. Simulation type:
    live play - 5
    constructive - 3
    virtual - 2
    N/A - 11

2. Application:
    EQUIPMENT/Equipment Characteristics/Sea - 9
    EQUIPMENT/Equipment Characteristics/Sensors - 2
    EQUIPMENT/Equipment Performance/Sea - 9
    EQUIPMENT/Equipment Performance/Missiles - 1
    EQUIPMENT/Equipment Performance/Sensors - 3
    TACTICS, TECHNIQUES & PROCEDURES (TTP) COGNITIVE/Tactics - 9
    TACTICS, TECHNIQUES & PROCEDURES (TTP) COGNITIVE/Operational - 7
    TACTICS, TECHNIQUES & PROCEDURES (TTP) COGNITIVE/Doctrine - 2
    PREDICTIVE MODELS/Oceanographic environment - 16
    PREDICTIVE MODELS/Shore environment - 1
    PREDICTIVE MODELS/Atmospheric environment - 2
    FORCE DESCRIPTION/MASINT - 1
    HUMAN FACTORS/Cognitive - 1
    HUMAN FACTORS/Other - 1
    SERVICE SUPPORT/Maintenance - 1
    SERVICE SUPPORT/Other - 1
    SCENARIO/Army/STW - 2
    SCENARIO/Army/SEW - 1
    SCENARIO/Army/LOG - 2
    SCENARIO/Army/C3I - 2
    SCENARIO/Navy/ASW - 13
    SCENARIO/Navy/AMW - 7
    SCENARIO/Navy/NSW - 6
    SCENARIO/Navy/STW - 4
    SCENARIO/Navy/MIW/MCM - 10
    SCENARIO/Navy/AAW - 4
    SCENARIO/Navy/ASUW - 4
    SCENARIO/Navy/OS - 9
    SCENARIO/Navy/LOG - 7
    SCENARIO/Navy/C3I - 3
    SCENARIO/Air Force/STW - 2
    SCENARIO/Air Force/AAW - 2
    SCENARIO/Air Force/SEW - 2
    SCENARIO/Air Force/OS - 1
    SCENARIO/Air Force/LOG - 2
    SCENARIO/Air Force/C3I - 2
    SCENARIO/Marine Corps/AMW - 6
    SCENARIO/Marine Corps/NSW - 5
    SCENARIO/Marine Corps/MIW/MCM - 9
    SCENARIO/Marine Corps/OS - 6
    SCENARIO/Marine Corps/LOG - 7
    SCENARIO/Marine Corps/C3I - 3

SCENARIO/Marine Corps/Other - 1
SCENARIO/Joint - 3
SCENARIO/Combined - 2
SCENARIO/Operations Other Than War/Wargames - 6
SCENARIO/Peace - 4
TEST RESULTS/Operational - 8
MISCELLANEOUS/Training - 1

PART 3 (15 respondents; 15 surveys)

I. Parameters and resolutions

(IN means used as input; OUT means output of model or simulation. HR, VR, TR, AR refer to horizontal, vertical, temporal and angular resolutions, respectively.)

PARAMETER	IN	OUT	HR	VR	TR	AR
Sediment classification	1		1 km		> decade	
Sediment type	1		1 km		> decade	
Sediment thickness	1		1 km		> decade	
Sediment grain size	1		1 km		> decade	
Bottom compressibility	1		1 km		> decade	
Bottom bulk density	1		1 km		> decade	
Sediment concentration	1		1 km		> decade	
Bottom roughness	1		1 km		> decade	
Bottom shear strength	1		1 km		> decade	
Bottom loss	1		1 km		> decade	
Bottom attenuation coefficient	1		1 km		> decade	
Bottom scattering	1		1 km		> decade	
Sediment sound speed	1		1 km		> decade	
Water depth	9		1 m; 1, 10, 100 km	1 m; 100 m	> decade	
Bottom slope/gradient	2		1 m; 1 km	1 m	> decade	
Turbulence		3	10, 100 km	100 m	several hrs	
Mixed layer depth - water	1	6	10, 100 km	100 m	sev. hrs, 1 day	

Horizontal diffusivity	1	2	10, 100 km	100 m	sev. hrs, 1 day	
Vertical diffusivity	1	3	10, 100 km	100 m	sev. hrs, 1 day	
Mixing length coefficient		3	10, 100 km	100 m	several hrs.	
Temperature profile	5	6	1, 10, 100 km	1, 100 m	sev. hrs, 1 day, 1 wk	
Tidal elevation	2	2	10 km	100 m	sev. hrs	
Tidal current		1	1 km		1 hr	
Sea state		1	100 km		sev. hrs	
Sea dir/angle		1	100 km		sev. hrs	
Sea height/SWH		1	100 km		sev. hrs	
Sea period/freq		1	100 km		sev. hrs	
Sea wavenumber/length		1	100 km		sev. hrs	
Sea wavenumber spectrum		1	100 km		sev. hrs	
Sea spectral freq/period		1	100 km		sev. hrs	
Sea mean spec. freq/T		1	100 km		sev. hrs	
Sea peak spec. freq/T		1	100 km		sev. hrs	
Sea peak spectral height		1	100 km		sev. hrs	
Sea spectral propag. dir		1	100 km		sev. hrs	
Sea mean spec. prop. dir		1	100 km		sev. hrs	
Sea peak spec. prop. dir		1	100 km		sev. hrs	
Swell direction/angle		1	100 km		sev. hrs	
Swell height		1	100 km		sev. hrs	
Swell period/freq.		1	100 km		sev. hrs	
Swell wavenumber spectrum		1	100 km		sev. hrs	
Horiz. depth-ave. current		5	1, 10 km	1, 100 m; 1 km	sev. hrs, 1 day	
Horiz. surface current		7	1, 10, 100	100 m	1 hr, sev.	

			km		hrs, 1 day	
Horiz. subsurface current		7	1, 10, 100 km	100 m, 1 km	sev. hrs, 1 day	
Horiz. current shear		4	1, 10, 100 km	100 m	sev. hrs, 1 day	
Vert. depth-ave. current		2		100 m		
Vertical current profile		4	10 km	1, 100 m	1 day	
Vertical current shear		3		100 m		
Mean current		2	10 km	100 m, 1 km	sev. hrs, 1 day	
Wind-driven current		7	1, 10, 100 km	100 m, 1 km	sev. hrs, 1 day	
Geostrophic current		5	1, 10, 100 km	100 m, 1 km	sev. hrs, 1 day	
Intertial current		3	10, 100 km	100 m	sev. hrs, 1 day	
Ekman current		3	10, 100 km	100 m	sev. hrs, 1 day	
Shelf wave current		1	10 km	100 m	sev. hrs	
Sea ice concentration	2	1	100 km		1 day, 1 wk	
Sea ice extent	2	1	100 km		sev. hrs, 1 day	
Sea ice thickness	2	1	100 km		1 wk	
Sea ice location	2	1	100 km		sev. hrs, 1 day	
Front location	2	5	1, 10 km	1, 100 m; 1 km	1 day	
Front horiz. temp. gradient	1	4	1, 10 km	1, 100 m	1 day	
Front vert. temp. gradient	1	4	1, 10 km	1, 100 m	1 day	
Front horiz. SS gradient	1	4	1, 10 km	1, 100 m	1 day	
Front vert. SS gradient	1	4	1, 10 km	1, 100 m	1 day	
Front mixed layer depth chg.		5	1, 10, 100 km	100 m	sev. hrs, 1 day	

Front sound chnl axis chg.		4	1, 10 km	100 m	1 day	
Eddy location	2	5	1, 10 km	1, 100 m; 1 km	1 day	
Eddy radius	2	4	1, 10 km	1, 100 m; 1 km	1 day	
Eddy horiz. temp. gradient	1	4	1, 10 km	1, 100 m	1 day	
Eddy vert. temp. gradient	1	4	1, 10 km	1, 100 m	1 day	
Eddy horiz. SS gradient	1	2	1, 10 km	1, 100 m	1 day	
Eddy vert. SS gradient	1	2	1, 10 km	1, 100 m	1 day	
Eddy mixed layer depth chg.		2	10 km	100 m	1 day	
Eddy sound chnl. axis chg.		2	10 km	100 m	1 day	
Water quality	2		1 km	1 m	1 day	
Density		2	10 km	100 m	sev. hrs, 1 day	
Salinity profile	5	6	1, 10, 100 km	1, 100 m	sev. hrs, 1 day, 1 wk	
Anthro. ambient noise	1		1 km		1 hr	
Biol. ambient noise	1		1 km		1 hr	
Wind/wave AN	1		1 km		1 hr	
Surf AN	1		1 km		1 hr	
Rain/precip. AN	1		1 km		1 hr	
Ice AN	1		1 km		1 hr	
Thermal AN	1		1 km		1 hr	
Seismic AN	1		1 km		1 hr	
Acoustic sea state	1		1 km		1 hr	
Volume reverb.		1				
Sound speed profile/grad.	1		1 km		sev. hrs	
Transmission loss		1				
Surface reflection loss		1				
Wind speed @ 10 m	4	1	1, 10 km	100 m	sev. hrs, 1	

					day	
Wind friction velocity	1	1	10 km	100 m	sev. hrs	
Wind roughness length	3	1	1, 10, 100 km	100 m	sev. hrs, 1 day	
Surface wind	2	1	10, 100 km	100 m; 1 km	sev. hrs, 1 day	
Surface wind vector	3		1, 10 km		sev. hrs, 1 day	
Wind stress		1				
Wind stress scalar	1		100 km			
Wind stress vector	6		1, 10, 100 km	100 m	1 hr, sev. hrs, 1 day	
Relative humidity	1	1	10 km	100 m	sev. hrs	
Specific humidity	1	1	10 km	100 m	sev. hrs	
Surface air pressure	2	1	10 km	100 m	sev. hrs	
Air temp. @ 10 m	5	1	1, 10, 100 km	100 m	1 hr, sev. hrs, 1 day	
Cloud cover	3	2	10, 100 km	100 m	1 hr, sev. hrs	
Precipitation type		1				
Precipitation rate		1				
Mixed layer depth- air/sea		1				
Sea surface temperature	5	2	1, 10 km	100 m	1 hr, sev. hrs, 1 day	
Surface solar heat flux	7	1	1, 10, 100 km	100 m	sev. hrs, 1 day	
Surface longwave heat flux	7	1	1, 10, 100 km	100 m	sev. hrs, 1 day	
Surface latent heat flux	7		1, 10, 100 km	100 m	sev. hrs, 1 day	

II. Databases used:

AVHRR(1) - 1
AVHRR(2) - 1
AVHRR(3) - 1
BATHY
BUOY
DAILIES
DGDEM
GDEM
ICECAP
ICECLIMO
Levitus - 8
MCSST
MOODS
NODC Historical Temp. & Salinity Profiles - 2
SCDB
SHIP SYNOPTIC
SIGRID
Coastal Shoreline - 2
DBDB-1 - 1
DBDB-2 - 1
DBDB-5 - 9
DBDB-C - 2
DTED - 2
ETOPO5 - 2
HITS - 1
LFBL - 1
SSMI - 4
VSS - 1
WVS - 5
AIREPS - 1
AIRWAYS - 1
AMDAR - 1
BUOYS - 2
Cloud Cover - 1
LAND SYNOPTIC - 1
PIBAL - 1
RAOBS - 1
SATWINDS - 1
Hellerman-Rosenstein Wind Stress Climatology - 1
Cloud Cover from satellites - 1
Other - 1

III. Data generating models:

OCEANS - 1
OTIS - 4
PIPS - 1
POM - 1
SWANS - 1
WAM (FLTNUM) - 1
DAF - 1
ECMWF - 4
NOGAPS - 7
NORAPS - 5